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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,487	04/16/2004	Bo Zheng	007589/PPC/ECP	1358

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PATTERSON & SHERIDAN, LLP
3040 POST OAK BOULEVARD, SUITE 1500
HOUSTON, TX 77056

EXAMINER	
GEORGE, PATRICIA ANN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/826,487	ZHENG ET AL.	
	Examiner	Art Unit	
	Patricia A. George	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 6-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1-3, 5, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nayak et al. of USPN 6,494,219 in view of Uzoh et al. of USPN 6,056,869.

Nayak et al. of USPN 6,494,219 teaches a method and apparatus with etchant for removing unwanted deposits (col. 1, lines 14-16) from the beveled edge of the wafer (fig. 2A, part 33). When the substrate is in the pre-process position, the actuator rotates (col.8 line 43) the spindle (fig. 1, part 518). Which is supported by a vacuum chuck (fig.1, part 516), an etching solution is dispensed onto the beveled edge of the production surface of the substrate (col.8-9, lines 66-3) with a rotating (i.e. pivot) nozzle (fig. 5, part 150); and dispensing DI water (as in claim 3), from a second adjustable fluid dispensing nozzle (col. 2., line 55-63). Nayak teaches the flow of fluid is prescribe by use of valves via a controller (col.9, l.25-35), which would allow the user to prescribe to a simultaneous dispense.

Although Nayak does not "refer" to the use of a protective fluid, Nayak is considered to encompass the use of a protective fluid because discloses dispensing DI water which is the same protective fluid claimed by applicants' in claim 3.

Uzoh et al. teaches use of DI water to protect a portion of the wafer (col.2, l.33) from an etchant (col. 6l. 12-13).

Although Nayak is silent about dispensing the protective fluid (i.e. DI water) in the center of the wafer, Nayak does teaches nozzles in ERB systems can be adjusted to direct etchant and/or water at desired locations on the substrate.

Therefore It would have been obvious to one of ordinary skill in the art at the time of invention was made, to dispense DI water in the central portion of the wafer, in the process of Nayah, because Uzoh illustrates that use of water prevents an etchant from maintaining substrate real estate, and Nayak teaches nozzles can be adjusted to desired locations. One of ordinary skill desiring to etch the beveled edge, in Nayah, would be motivated to dispense the protective fluid (i.e. DI water) in the center of the wafer in order to selectively etch the edge of the wafer and not the center of the wafer, because the teachings of Nayah and Uzoh make such a provision.

As for claim 5, Nayak et al. teaches the spindle that supports the substrate can be rotated up to about 2000 rpm, which overlaps applicants claimed range of about 500-2000 rpm.

Nayak et al., is silent as to dispensing de-ionized water onto a backside of the substrate during the dispensing of the etching solution, as in claim 9.

As for claim 9, Uzoh et al. of USPN 6,056,869 teaches dispensing deionized water onto a backside of the substrate to protect the surface during the dispensing of the etchant (see figure 3A).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of removing unwanted deposits with cleaning acids from the beveled edge of the wafer, as Nayak et al., to include dispensing de-ionized water onto a backside of the substrate during the dispensing of the etching solution, because Uzoh teaches the DI water protects the wafer.

As to claim 2, Nayak et al., teaches use of cleaning acids, such as sulfuric acid (col. 7, line 38).

As for claim 6, although Nayak does not explicitly teach the dispense of the protectant terminates less than 1 second after the dispenseing of the etchant, Nayak teaches the use of a general purpose microcontroller, a general purpose computer, is used to individually control multiple dispenses of chemical supply, including flow rates, pressure, and the timing of any associated valves (see col. 7- 8, lines 65 through 10), which would allow one of skill in the art to configure the timing of the fluids to stop and start as desired, through use of keyboard and monitor entry.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include any step of dispensing the protectant to terminate as

desired, as applicants' claimed limitation, when removing unwanted deposits, as Nayak, because Nayak teaches the system user has control of the input for desisred process parameters, and Ulrich illustrates dispensing of the etchant continues after the dispense of the protectant fluid commences. Further in absence of unexspected results, one skilled in the art would select recipe configurations of dispensing order and duration for their result desired, by use of routine experimentation.

Claim Rejections - 35 USC § 103

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nayak et al. and Uzoh et al. as applied to claims 1, 3, and 9 above, and further in view of Ohmi et al of USPN 5,487,398.

The modified teaching of Nayak et al., do not teach dispensing the etching solution at 0.25L/min to 2.5L/min for 3-10 seconds, as in claim 7, and rotating the substrate at 100 –300 rpm, as in claim 8.

As for claim 7, Ohmi et al. teaches rotary cleaning of wafers using the flow rate of 100-50 0 ml/min which overlaps the range claimed 0.25L/min to 2.5L/min for 3-10 seconds; and using an automatic control system that allows the user to set the feed time to an optimum time (col.11, lines 30-50).

As for claim 8, Ohmi et al. teaches a spin speed of 100 to 400 rpm which encompasses the claimed limitation.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of removing unwanted deposits with

cleaning acids from the beveled edge of the wafer, as in the modified teachings of Nayak et al., to include the flow rate, time, and speed of Ohmi et al, because Ohmi teaches using silicon wafers with cleaner surface decreases the total cost (of production) by producing high-performance semiconductor (see abstract).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 10 and 17, and 18 are rejected under 35 U.S.C. 102(b) as being by Ulrich et al. (5,897,379) (herein referred to as Ulrich).

With respect to claim 10, Ulrich teaches a method for removing deposited copper (i.e. unwanted metal) from the top surface and wafer sides (i.e beveled edge) of a semiconductor wafer (i.e. substrate), by rotating the wafer (see fig. 14), by securing the substrate to a rotatable support assembly (see fig. 7), at a rate of between 250 and 1000 rpm (overlapping and encompassed by applicants range of about 500 to 2000 rpm) (col.1, line 50), as in claims 10 and 18; dispenses DI water (i.e. protective fluid) onto the surface of the IC (i.e. production surface) (see col.4, lines 30-35) wafer, applied at the center of the production surface, simultaneously with copper etchant onto the top edge and beveled edge of the wafer (i.e. edge bead removal solution).

As to the cleaning of the exclusion zone, as in claim 17, Ulrich teaches (col.3, line 29) the removal of the metal from the top surface edge (i.e. exclusion zone), as well as the sides (i.e. beveled edge) of the wafer.

Claim Rejections - 35 USC § 103

Claim 11 rejected under 35 U.S.C. 103(a) as being unpatentable over Ulrich, as applied to claim 10 above, further in view of Abraham (6,363,623).

Although Ulrich teaches positioning the substrate onto a rotatable vacuum chuck (see fig. 7). Ulrich is silent as to securing the substrate by centering it between 3 rotatable centering posts.

As for claim 11, Abraham teaches securing the substrate by centering it between three pivot pins having rotatable fingers (see col.4-5, lines 55 through 11).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include securing the substrate by centering it between 3 rotatable centering posts, as Abraham, when removing unwanted materials from a wafer, as Ulrich, because Abraham teaches a method for centering that over comes Industry deficiencies, is highly automated, efficiently cleaning with minimal but reliable contacting of the work piece surface (see last para. of Background).

Claim Rejections - 35 USC § 103

Claims 12 – 16, and 19-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ulrich, as applied to claim 10 above, further in view of Nayak et al. (6,494,219).

Although Ulrich teaches dispensing the protective fluid onto the central portion of the substrate from a fluid nozzle (i.e. aperture) (see figure 12), Ulrich is silent as to the aperture positioned on a distal end of a pivotally mounted fluid dispensing arm, as in claim 12.

Nayak teaches the aperture positioned on a distal end of a pivotally mounted fluid dispensing arm (see figs. 7 and 8).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the aperture positioned on a distal end of a pivotally mounted fluid dispensing arm, as Nayak, when removing unwanted materials from a wafer, as Ulrich, because Nayak teaches such a configuration provides adjustability of the position of the aperture which allows a great deal of flexibility in there use, contacting the edges of substrates in a close proximity and directing fluid at different angles to contact both the edges and to accommodate substrates of varying sizes (see col. 5, line 35-52).

With regard for claim 13, the modified teaching of Ulrich teaches protective fluid comprises deionized water, see discussion above.

With regard to claim 14 Nayak teaches dispensing the edge bead removal solution comprises positioning a fluid dispensing nozzle extending from a distal end of a pivotally mounted etchant dispensing arm above the bevel edge of the substrate and dispensing the edge bead removal solution from the nozzle onto the bevel edge (see col.2, lines 53-63 and discussion toward claim 12 above).

As for claim 15, Nayak teaches the edge bead removal solution comprises surfuric acid (col. 10, lines 54-60).

As for claims 16 and 19, Ulrich teaches dispensing the deionized water onto the production surface of the substrate is terminated after the protection layer is formed (as in claim 16) and the dispensing of the etchant solution is continued (as in claim 16), by a technique of cycling between steps (indicating termination of DI water as in claim 19), which conserves the amount of chemical that is used, as in claims 16, and 19. (see

As for claim 20, Ulrich does not explicitly teach thickness of protectant film sufficient to protect, as up to 150 angstroms in applicants claimed limitation.

Nayak teaches the fluid flow is dispensed at the rate which is user prescribed via the valve controller (col. 9, l.25-35), but is not explicit towards the protectant layer thickness of up to 150 angstroms, as applicants' claim.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to dispense any thickness of protectant film sufficient to protect, as up to 150 angstroms in applicants claim 20, because Ulrich does not limit the thickness value and Nayak teaches user prescribed process recipes. Therefore, one

skilled in the art would have the skill to determine sufficient thickness ranges for protectant layer by routine experiementation. It has been held that it would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as [thickness of protectant film] through routine experimentation in the absence of a showing of criticality.

As for claim 21, Ulrich does not explicitly teach dispensing the DI water through the dispense of the edge bead removal.

Nayak teaches the use of a general purpose microcontroller, a general purpose computer, is used to individually control multiple dispenses of chemical supply, including flow rates, pressure, and the timing of any associated valves (see col. 7- 8, lines 65 through 10), which would allow one of skill in the art to configure the timing of the fluids to stop and start as desired, through use of keyboard and monitor entry.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include a step of dispensing the DI water through the dispense of the edge bead removal, as applicants' claimed limitation, when removing unwanted materials from a wafer, as Ulrich, because Nayak teaches the system user has control of the input for desisred process parameters, and Ulrich illustrates dispensing of the etchant continues after the dispense of the protectant fluid commences. . Further in absence of unexspected results, one skilled in the art would select recipe configurations of dispensing order and duration for their result desired, by use of routine experimentation.

As for claim 23, see discussion above (Nayak's figures 7 and 8 and) where the modified reference of Ulrich teaches dispensing deionized water onto a central portion of the semiconductor substrate including a first pivotally mounted fluid dispensing arm positioned with the a first terminating end (nozzle) over the central portion of the substrate, and dispensing an edge bead removal solution onto an exclusion zone of the semiconductor substrate with a second pivotally mounted fluid dispensing arm having a second terminating end (i.e. nozzle) positioned over the exclusion zone (i.e top edge) of the substrate.

As for claim 24, the modified invention of Ulrich does not explicitly teach the edge bead removal solution is dispensed between about 1 L/min and about 2.5 L/min and for a duration of between about 3 seconds and about 10 seconds, as applicants' claim.

However, Nayak teaches the edge bead removal solution is dispensed at a rate that can be varied to achieve the particular desired results of effective etch rate (see col. 11, lines 48-54).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include dispensing the edge bead removal solution at any desired rate and duration, such as between about 1 L/min and about 2.5 L/min and for a duration of between about 3 seconds and about 10 seconds, as applicants' claim 24, because Nayak teaches the edge bead removal solution is dispensed at a rate that can be varied to achieve the particular desired results of effective etch rate. Therefore, in

absence of a show of unexspected results, the desired rate and duration could be determined through routine experimentation, as Nayak teaches the edge bead removal solution is dispensed at a rate that can be varied to achieve the particular desired results of the effective etching rate.

As for claim 22, Nayak et al., teaches use of cleaning acids, such as sulfuric acid (col. 7, line 38).

Response to Arguments

In response to applicant's argument, on page 8, it is acknowledged that Nayak is silent about the "simultaneous" dispense of a "protective" fluid and etching solution. However, as previously note, above, "Nayak would allow the user to prescribe a simultaneous dispense." Applicants "simultaneous" dispense of DI water (i.e. protective fluid) and etchant does not distinguish over the example of separately dispensing in the reference of Nayak, because it has been held that any order of performing process steps is prima facie obvious in the absence of unexpected results. See In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results); and In re Gibson, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is prima facie obvious.). See MPEP 2144.04.

As for applicants' argument that the reference of Uzoh does not teach the subject matter in claim 1, Applicants' note, on page 8, the reference of Uzoh teaches deplating (which is removing, i.e. cleaning) the sides of a semiconductor substrate, (i.e. the beveled edge). Uzoh's teaches that water can be used as a protectant fluid on a wafer, is relavant art. Examiner stands, that it would have been obvious to one of ordinary skill in the art at the time of invention was made, to dispense DI water in the central portion of the wafer, in the process of Nayah, because Uzoh illustrates that use of water prevents an etchant from maintaining substrate real estate, and Nayak teaches nozzles can be adjusted to any desired locations. One of ordinary skill desiring to etch the beveled edge, in Nayah, would be motivated to dispense the protective fluid (i.e. DI water), simultaneously, in the center of the wafer in order to selectively etch the edge of the wafer and not the center of the wafer, because the teachings of Nayah and Uzoh make such a provision.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PAG
08/06

Patricia A George
Examiner
Art Unit 1765

NADINE NORTON
SUPERVISORY PATENT EXAMINER
ART UNIT 1765